

A Proposal to the
**NOAA Coastal Services Center
2007 Coastal Management Fellowship Program**

Submitted by the
**South Carolina Department of Health and Environmental Control
Office of Ocean and Coastal Resource Management**

Project Title:
Planning for Shoreline Change in South Carolina



**Ocean and Coastal
Resource Management**

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Background and Introduction

The Office of Ocean and Coastal Resource Management (OCRM), a division of the South Carolina Department of Health and Environmental Control (SCDHEC), implements the SC Coastal Management Program. The Program was established in 1977 under the SC Coastal Zone Management Act, which requires the agency “to protect the quality of the coastal environment and to promote the economic and social improvement of the coastal zone and of all the people of the State.” OCRM has direct permitting authority over the “critical areas” of the coast, defined as coastal waters, tidelands, and the beach/dune system. Indirect management authority of coastal resources is granted to OCRM throughout the eight coastal counties (Horry, Georgetown, Berkeley, Charleston, Dorchester, Colleton, Beaufort, and Jasper), which together comprise the landward extent of the state’s “coastal zone” (the coastal zone also includes coastal waters and submerged lands seaward to the State’s jurisdictional limits). Within the coastal zone, OCRM has the authority to review any project requiring a state permit (certification); as well as any federal permit, license, funding, or direct federal activity (consistency determination) to determine if the project is consistent with the policies and procedures of the SC Coastal Management Program.

In the past decade, South Carolina’s eight coastal counties have experienced rapid growth, much of which has occurred in the form of sprawling residential development. In fact, the coastal counties accounted for approximately one-fourth of the state’s growth in population between 1990 and 2000 (Tibbetts, 2004; Henry and Barkley, 2002). This growth has resulted in even greater pressures to develop waterfront properties – not only beachfront, but also along estuarine, riverine, and tidal creek shorelines. At the same time, many of these shorelines are experiencing erosion due to natural (e.g. barrier island migration, sea level rise, coastal storms) and anthropogenic (e.g. jetties, dams) forcings. Scientists are projecting increased rates of sea level rise in response to global climate change. Over the past century, relative sea level rise is estimated between 23-30 cm, and projections range from doubling to even tripling of that rate during the coming century (EPA, 1998). Shoreline erosion is expected to increase as the rate of sea level rise increases, as are the impacts of coastal storms. The coast is considered overdue for a major hurricane strike – the last significant storm impact occurred in 1989 (Hurricane Hugo).

The SC Coastal Management Program has a number of policies and regulations that influence shoreline development. Most importantly, the state has adopted a policy of “retreat” from eroding beaches. Under the state’s Beachfront Management Act, OCRM establishes and periodically revises two lines of jurisdiction for oceanfront property: the “baseline” and the more landward 40-year “setback line.” These lines establish the boundaries for the state’s jurisdiction, and are used to regulate the size and location of new or replacement structures located near the beach. Seaward of the setback line, new erosion control structures such as seawalls and rock revetments are banned, and new habitable structures are limited in size to 5,000 square feet of heated space, effectively eliminating new commercial hotels and condominiums. These same lines are used to regulate the repair or reconstruction of existing erosion control structures and habitable

structures following a storm. Existing seawalls cannot be rebuilt if the degree of damage to the structure exceeds 50%, while existing habitable structures must be rebuilt farther landward, if possible, when storm-related damage exceeds 66%. In order to enforce these building restrictions OCRM must conduct post-storm damage assessments. These damage assessments are based on the pre-storm condition of the structure. In an attempt to document pre-storm conditions, over the years the agency has developed a mix of digital and 35 mm print photographs of most oceanfront structures in the state. Houses that are presently out of the state's jurisdiction may become jurisdictional if the baseline and setback line are revised landward.

There is no similar policy of retreat for non-beachfront shorelines. Developments are generally not permitted to encroach into tidal marshes, including the transitional banks of the marshes. However, permit applications for bulkheads and revetments appear to be increasing over the past few years, and permits are not required for erosion control devices constructed landward of the "Critical Line" as defined by the agency. Therefore, the percentage of shoreline that is hardened is presently unknown, and trends are difficult to evaluate because permits were not tracked (or were not consistently tracked) prior to 2001.

Recently, the program has been under heightened public scrutiny due to proposed encroachments of large-scale developments, swimming pools, septic systems, and individual residences in the beachfront setback area. Renourishment projects continue at a rapid pace, and erosion control devices are increasing along tidal creeks and estuarine shorelines. OCRM needs to evaluate the extent and implications of these trends in order to weigh policy alternatives. Current data limitations, both natural and socioeconomic, as well as complex regulatory and legal issues, result in an unclear understanding of future scenarios, and of our ability to adapt to shoreline change in the coming decades.

Goals and Objectives

The goal of this fellowship will be to assess the past, present, and future conditions of the South Carolina coast, with a focus on shoreline development trends. The primary objectives of the project are to:

1. Develop a "State of Knowledge" report on sea level rise, erosion, and shoreline development in South Carolina.
2. Assess the status and trends of erosion control structures along South Carolina's coastline based on an analysis of permit trends.
3. Inventory beachfront structures based on aerial imagery.
4. Assist with revisions to baselines and setbacks for beachfront development by working directly with the Staff Oceanographer.
5. Develop a database of beach nourishment projects, monitoring, and results.
6. Draft policy recommendations for SCDHEC-OCRM

Project Description

Objective 1 – State of Knowledge Report on sea level rise, erosion, and shoreline development in South Carolina

The Fellow will research and catalogue all studies and reports regarding sea level rise, erosion rates, shoreline change, and shoreline development in South Carolina. This information will be maintained in an Access database, and a summary report will be created that identifies key findings and information gaps. The research will also explore potential applications of new observing system infrastructure in South Carolina, including HF Radar installations and Acoustic Doppler Current Profiling stations, in projecting erosional “hotspots” based on wave and current dynamics along the shoreline.

Objective 2 – Assessing the status and trends of shoreline erosion control structures

The Fellow will research archived and current “Critical Area” permits to provide accurate numbers of shoreline protection devices that have been permitted over the past 25 years. A comparison will be developed showing the rate of increase in hardening of the shoreline from the 1980’s to the 1990’s and through the past 6 years. The Fellow will also evaluate the linear footage of permitted structures and estimate the percentage of the South Carolina coast that is presently armored, the rate of armoring, and a “build-out” projection estimating the percentage of South Carolina’s coast that could be hardened based on the current rate and regulatory framework in 10, 20, and 50 years. The Fellow will also research alternative shoreline hardening strategies, both within and outside of South Carolina.

Objective 3 – Inventory of beachfront structures

The Fellow will conduct an inventory of existing digital and print photographs of beachfront structures. These photographs will be scanned, printed, and compiled into a database. New photographs will be obtained as needed due to new construction or changes in baseline and setback line positions.

Objective 4 – Revise baselines and setbacks for beachfront development

South Carolina’s Beachfront Management Act requires OCRM to conduct a statewide revision of the baseline and setback line (based on 40-year erosion rates) every eight to ten years. These jurisdictional lines were originally established in 1990, and were revised between 1999 and 2000. The next revisions are targeted for completion between 2007 and 2009. In order to establish and revise these jurisdictional line positions, OCRM has obtained aerial photographs dating back to the 1960s for most islands and beaches in the state, and recent topographic LIDAR for many islands and beaches. Beach cross-section profile data has also been collected at approximately 400 monitoring stations statewide for the past 15 years. This line revision work will include several components. For “unarmored standard zones,” the primary dune crest location will be determined by analyzing topographic LIDAR data where available, or by collecting data in the field with

GPS equipment. For “armored standard zones,” the theoretical dune crest location will be calculated using beach cross-sectional topographic data collected by a contractor. For inlet zones, the baseline will be set at the most landward shoreline position shown on a series of historical aerial photographs. Existing long-term erosion rates for all islands and beaches in the state will be reviewed and modified as necessary to include erosion trends over the past eight to ten years. Using the new baseline positions as a reference, new 40-year setback line positions will be established.

Objective 5 – Track Beach Nourishment Monitoring Efforts

The Fellow will evaluate program policies on beach nourishment, and develop a database that can be used to track nourishment projects and results. The database will include past and ongoing projects, and will aid OCRM in evaluating the permit conditions that should be attached to future projects. Permit conditions have varied across past renourishment projects and between management agencies. They have at times included requirements for monitoring erosion rates, compaction, ecological impacts to burrowing macroinvertebrate species, sand quality, impacts to sea turtle nests, and biological recovery and refilling of borrow sites. It would be beneficial for OCRM to track monitoring and results for nourishment projects, including those required by other agencies.

Objective 6 – Draft Policy Recommendations for SCDHEC-OCRM

Based on the results of Objectives 1-5, the Fellow will draft and present policy recommendations for consideration by SCDHEC-OCRM as related to future shoreline alterations and development.

Milestones and Outcomes

<u>Milestone</u>	<u>Outcome</u>
April 2007	Attend Fellow matching workshop.
July 2007	Fellow is hosted on a preliminary visit to SCDHEC-OCRM’s offices in Charleston, SC.
August 2007	Fellowship begins. Fellow orientation at OCRM with an introduction to staff and briefing from key staff members regarding South Carolina’s coastal zone management program. Fellow reviews South Carolina’s procedure and data requirements for revising beachfront jurisdictional lines and permitting shoreline developments.
September 2007	Fellow and mentor conduct site visits to a variety of representative islands and beaches in the state, to develop local knowledge.

November 2007	Fellow completes “State of Knowledge Report” on shoreline change in SC.
December 2007	Fellow begins review of archived “Critical Area” permits to provide accurate numbers of shoreline protection devices.
April 2008	Fellow completes report on shoreline hardening status and trends, including analysis of alternative hardening techniques used in other coastal states.
May 2008	Fellow begins inventory of beachfront structures using historical aerial photograph and beach survey database; scans and prints photographs, obtain new photographs as needed, and compiles into a database.
August 2008	Inventory of Beachfront Structures completed.
September 2008	Fellow begins a combination of GPS field work to obtain dune crest locations and GIS office work to assist in calculation of new baseline and setback line positions for SC beaches.
January 2008	Baseline and setback line revision work ends.
February 2008	Fellow begins research concerning past and ongoing renourishment projects, begins developing database to track permit conditions and results.
June 2008	Fellow completes renourishment database.
July 2008	Fellow drafts and presents policy recommendations to SCDHEC-OCRM staff. Fellowship ends.

Cost Share Description

SCDHEC-OCRM will provide in kind services and \$15,000 (\$7500 for Year 1/\$7500 for Year 2) in non-federal match for the NOAA Coastal Services Center Fellow. This non-federal match will be provided with state revenue generated from SCDHEC-OCRM’s regulatory programs. SCDHEC-OCRM will also provide additional non-federal match associated with various operating expenses, including travel, supplies, equipment and other costs.

For in kind services, SCDHEC-OCRM will provide the Fellow with a desktop computer and/or laptop with Microsoft Office and ArcGIS software; access to high-resolution aerial photography; access to a large format scanner and plotter; use of state vehicles for

field work and other related travel; opportunities to attend training sessions such as advanced ArcGIS training; and use of all general office equipment.

Fellow Mentoring

The Fellow will receive primary mentoring benefits from three SCDHEC-OCRM employees with extensive experience in coastal zone management, coastal geologic process, and Geographic Information Systems. Braxton Davis, Director of OCRM's Science and Policy Division, will be the primary mentor and will provide general oversight for the Fellowship. Braxton has experience in both natural and political science research. He recently joined OCRM having served as faculty at the University of South Carolina, and is the current Chair of the Coastal Hazards Committee for the Coastal States Organization in Washington DC.

Bill Eiser, OCRM staff oceanographer, will provide direct guidance for all beachfront research and regulatory activities. Bill has over 15 years experience with South Carolina's coastal zone management program and over 20 years experience with coastal processes and coastal erosion in South Carolina. Bill was primarily responsible for establishing the initial beach baseline and setback line positions in 1990, and for the line revisions in 1998-1999. Bill's also serves as project manager for all beachfront permit applications, including oceanfront construction and beach renourishment projects, and can provide mentoring in real-world coastal zone management issues.

Josh Boulware is OCRM's data and GIS manager. Josh has ten years of experience in GIS and IT, and is actively developing a comprehensive GIS to support regulatory decision making and analysis, planning initiatives, and policy development. This effort combines custom application development, creation of up-to-date and accurate data sets, application of emerging technologies, and staff training to provide a solid foundation for decision making, and to allow OCRM staff to quickly and efficiently analyze and retrieve information for the GIS and peripheral databases. Josh will be able to provide mentoring in the application of GIS and related technologies as they pertain to coastal zone management. In addition to GIS, Josh will provide instruction in database development, application and use of GPS and PDA units for data collection and in-field analysis, and use of common PC-based applications to disseminate and share data with other members of the OCRM staff.

The Fellow will also benefit from daily exposure to 45 coastal zone management professionals with a variety of skills and backgrounds working at SCDHEC-OCRM. Opportunities will exist for the Fellow to participate in field work and permit review sessions for projects as diverse as dock and marina construction, navigation channel dredging, public highway construction, beach renourishment, and commercial high-ground development. OCRM staff members have a variety of backgrounds in engineering, planning, geography, oceanography, and geology, and will be available to interact with the Fellow on other coastal zone management issues as part of the Fellow's overall exposure to South Carolina's program.

Project Partners

As South Carolina's coastal zone management agency and host agency for the Fellow, SCDHEC-OCRM will provide opportunities for the Fellow to work with other regulatory and planning groups within the office. In addition, the Fellow will interact with the South Carolina Sea Grant Consortium on shoreline change research, and will participate in interagency meetings related to beachfront and shoreline management issues.

Thematic Areas

This fellowship touches on several of the themes described in the call for proposals. First, shoreline retreat policy must be considered a fundamental aspect of community and natural resource resiliency to coastal storms. Second, the "state of knowledge" synthesis will include an assessment of potential applications of Integrated Ocean Observing System assets in South Carolina, including new Acoustic Doppler Current Profiling stations and High Frequency Radar stations along the SC coast associated with the Southeast Atlantic Coastal Ocean Observing System and Carolinas Coastal Ocean Observing and Prediction System. Finally, the analysis of existing and project shoreline hardening devices addresses the thematic area focused on historical, current, and future conditions of landscapes and seascapes to support alternative land use and conservation planning.

References

- Environmental Protection Agency (EPA). 1998. *Climate Change and South Carolina*. Office of Policy, EPA 236-F-98-007w.
- Henry, M.S. & Barkley, D.L. 2002. *The Contribution of the Coast to the South Carolina Economy*. Clemson University Regional Economic Development Research Laboratory.
- Tibbetts, John H., ed. 2004. The coast's great leap. *Coastal Heritage Magazine* 19: 3-11. South Carolina Sea Grant Consortium, Charleston, SC.